

What is claimed is:

1 1. A chuck device for containers comprising:

2 a supporting structure;

3 a pair of arms rotatably supported on said supporting structure by way of a pair of
4 arm shafts, chuck claws for grasping a container being disposed on ends of said pair of
5 arms that open and close in tandem with a rotation around said arm shafts; and

6 an operation member capable of being externally operated;

7 wherein:

8 inward from said pair of arms is disposed a first drive section capable of integrally
9 rotating around said arm shaft of a first arm and being integral with said first arm, and a
10 second drive section disposed further toward said end of said arm than said first drive
11 section and capable of rotating integrally around said arm shaft of a second arm and being
12 integral with said second arm;

13 a biasing mechanism which biases said pair of arms around said arm shafts in a
14 direction of closing said ends of said arms;

15 a motion input mechanism disposed between said operation member and said first
16 drive section which converts motion accompanying external operation of said operation
17 member to a rotation motion of said first drive section centered around said arm shaft; and

18 a coupling mechanism disposed between said first drive section and said second
19 drive section which converts rotational motion of said drive section around said arm shaft
20 to a rotational motion of said second drive section around said arm shaft.

1 2. A chuck device as described in claim 1 wherein said motion input mechanism comprises
2 a cam mechanism to convert a motion of said operation member to rotation motion of said
3 first drive section.

1 3. A chuck device as described in claim 2 wherein:

2 said cam mechanism of said motion input mechanism is equipped with an arm drive
3 cam supported by said support structure to allow rotation around a cam axis line parallel to
4 said arm shaft, a cam surface being formed on an outer perimeter of said arm drive cam;
5 said arm drive cam being disposed opposite from said second drive section relative
6 to said first drive section;
7 such that said arm drive cam being rotated by operation of said operation member
8 from outside;
9 as said arm drive cam rotates, said cam surface of said arm drive cam moves back
10 and forth between a position where said first drive section is pushed out toward said second
11 drive section and a position where said first drive section is retracted to an opposite side
12 from said second drive section.

1 4. A chuck device as described in claim 3 wherein a first roller that comes into contact with
2 said cam surface of said arm drive cam is disposed on said first drive section.

1 5. A chuck device as described in claim 3 wherein:

2 a roller shaft parallel to said arm shaft is disposed on said first drive section; and
3 on said roller shaft, there is disposed a first roller coming into contact with said cam
4 surface of said arm drive cam, and a second roller coming into contact with said second
5 drive section.

1 6. A chuck device as described in claim 3 wherein a support section is disposed on said
2 cam surface of said arm drive cam to support said first drive section at said position pushed
3 out toward said second drive section.

1 7. A chuck device as described in claim 1 wherein said coupling mechanism comprises a
2 cam mechanism to convert rotation motion of said first drive section to rotation motion of
3 said second drive section.

1 8. A chuck device as described in claim 7 wherein said cam mechanism of said coupling
2 mechanism is equipped with a cam surface disposed on said second drive section and
3 coming into contact with said first drive section.

1 9. A chuck device as described in claim 1 wherein said biasing mechanism includes a
2 spring disposed between said support structure and said second arm and biasing said second
3 arm so that said chuck claws are biased in a closing direction.

1 10. A chuck device as described in claim 1 wherein said biasing mechanism includes
2 torsion coil springs on each of said pair of arm shafts to bias said pair of arms so that said
3 ends are biased in a closing direction.

1 11. A chuck device as described in claim 3 wherein:
2 said biasing mechanism includes, torsion coil springs disposed on each of said pair
3 of arm shafts to bias said pair of arms so that said ends are biased in a closing direction; and
4 both ends of a cam shaft rotatably supporting said pair of arm shafts and said arm
5 drive cam are supported by said supporting structure.

1 12. A conveyor device for containers comprising:
2 a chuck device as described in claim 1 ; and
3 a mobile body moving said support structure of said chuck device along a
4 predetermined conveyor path.

1 13. A conveyor device as described in claim 13 wherein a plurality of said chuck devices
2 are disposed on said mobile body along said conveyance path.

1 14. A conveyor device as described in claim 12 wherein an operation section is disposed
2 along said conveyance path that comes into contact with said operation member when said
3 chuck device moves.

1 15. A conveyor device as described in claim 14 wherein said operation section includes a
2 movable section capable of moving between an active position, where said operation
3 section is in contact with said operation member and operates said operation member, and a
4 stand-by position away from said operation member.

1 16. A conveyor device as described in claim 15 wherein said movable section is driven by
2 an electrical servo motor between said active position and said stand-by position.

1 17. In a chuck device wherein a chuck claw is removably mounted on an end of an arm
2 driven to perform a grasping action,
3 a chuck device wherein:
4 a cylindrically indented bearing surface is disposed on said arm;
5 a holding piece equipped with a cylindrical outer perimeter surface curved along
6 said bearing surface is disposed on said bearing surface using a tightening mechanism; and
7 an attachment base curved along said bearing surface and capable of being inserted
8 between said support piece and said bearing surface disposed on said chuck claw.

1 18. A chuck device as described in claim 17 wherein said tightening mechanism comprises
2 a bolt.

1 19. A chuck device as described in claim 18 wherein a slit is formed on said attachment
2 base of said chuck claw to allow said bolt to pass through.

1 20. A chuck device as described in claim 18 wherein:
2 a chuck bearing is disposed on said arm to receive reaction generated on said chuck
3 claw during said grasping action;
4 said bearing surface is formed to connect with a side of said chuck bearing section
5 that comes into contact with said chuck claw;

6 said bolt is set up to attach to said bearing surface in such a direction that, going
7 toward a rear end of said arm, said bolt extends from said bearing surface toward a back
8 surface relative to a side of said arm in contact with said chuck claw.

1 21. A chuck device as described in claim 20 wherein:

2 an arm shaft rotatably supporting said arm is disposed behind said bearing surface;
3 and
4 said bolt is screwed in between said bearing surface and said arm shaft.

1 22. A chuck device as described in claim 20 wherein:

2 left and right arms are disposed;
3 a bearing surface is disposed inward from each arm;
4 said bolts pass through said support pieces from inward of said arms and are
5 screwed into said arms; and
6 slits are disposed at ends of said chuck claws to allow insertion of a tool used to
7 manipulate said bolts.

1 23. A chuck device as described in claim 22 wherein a spring mechanism is disposed
2 between said support pieces attached to said bearing surfaces of said arms to draw said
3 support pieces toward each other.

1 24. A chuck claw wherein:

2 a grasping section performing grasping actions is formed on a first end; and
3 an attachment base curved to form a cylindrical surface is formed on a second end.

1 25. A chuck claw as described in claim 24 wherein a slit extending in a perimeter direction
2 of a cylindrical surface defined by said attachment base is disposed on said attachment base.

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AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (currently amended): A chuck device for containers comprising:

a supporting structure~~means~~;

a pair of arms rotatably supported on said supporting structure~~means~~ by way of a pair of arm shafts, chuck claws for grasping a container being disposed on ends of said pair of arms that open and close in tandem with a rotation around said arm shafts; and

an operation member capable of being externally operated ~~on from outside~~;

wherein:

inward from said pair of arms is disposed a first drive section capable of integrally rotating around said arm shaft of a first arm and being integral~~integrally~~ with said first arm, and a second drive section disposed further toward said end of said arm than said first drive section and capable of rotating integrally around said arm shaft of a second arm and being integral~~integrally~~ with said second arm;

a biasing mechanism ~~which means~~ biases said pair of arms around said arm shafts in a direction of closing said ends of said arms;

a motion input mechanism ~~is disposed~~ between said operation member and said first drive section which~~and~~ converts motion accompanying external operation of said operation member ~~from outside~~ to a rotation motion of said first drive section centered around said arm shaft; and

a coupling mechanism ~~is disposed~~ between said first drive section and said second drive section which~~and~~ converts rotational motion of said drive section around said arm shaft to a rotational motion of said second drive section around said arm shaft.

Claim 2 (currently amended): A chuck device as described in claim 1 wherein said motion input mechanism ~~comprises~~uses a cam mechanism to convert a motion of said operation member to rotation motion of said first drive section.

Claim 3 (currently amended): A chuck device as described in claim 2 wherein:

said cam mechanism of said motion input mechanism is equipped with an arm drive cam supported by said ~~support structure~~supported means to allow rotation around a cam axis line parallel to said arm shaft, a cam surface being formed on an outer perimeter of said arm drive cam;

said arm drive cam ~~being~~is disposed opposite from said second drive section relative to said first drive section;

~~such that~~ said arm drive cam ~~being~~is rotated by operation of said operation member from outside;

as said arm drive cam rotates, said cam surface of said arm drive cam moves back and forth between a position where said first drive section is pushed out toward said second drive section and a position where said first drive section is retracted to an opposite side from said second drive section.

Claim 4 (original): A chuck device as described in claim 3 wherein a first roller that comes into contact with said cam surface of said arm drive cam is disposed on said first drive section.

Claim 5 (original): A chuck device as described in claim 3 wherein:

a roller shaft parallel to said arm shaft is disposed on said first drive section; and

on said roller shaft, there is disposed a first roller coming into contact with said cam surface of said arm drive cam, and a second roller coming into contact with said second drive section.

Claim 6 (currently amended): A chuck device as described in ~~any one of claim 3 through claim 5~~ wherein a support section is disposed on said cam surface of said arm drive cam to support said first drive section at said position pushed out toward said second drive section.

Claim 7 (currently amended): A chuck device as described in ~~any one of claim 1 through claim 6~~ wherein said coupling mechanism comprisesuses a cam mechanism to convert rotation motion of said first drive section to rotation motion of said second drive section.

Claim 8 (original): A chuck device as described in claim 7 wherein said cam mechanism of said coupling mechanism is equipped with a cam surface disposed on said second drive section and coming into contact with said first drive section.

Claim 9 (currently amended): A chuck device as described in ~~any one of claim 1 through claim 8~~ wherein said biasing mechanism~~means~~ includes a spring~~means~~ disposed between said support structure~~means~~ and said second arm and biasing said second arm so that said chuck claws are biased in a closing direction.

Claim 10 (currently amended): A chuck device as described in ~~any one of claim 1 through claim 8~~ wherein said biasing mechanism means includes torsion coil springs on each of said pair of arm shafts to bias said pair of arms so that said ends are biased in a closing direction.

Claim 11 (currently amended): A chuck device as described in claim 3 wherein:
as-said biasing mechanism includes~~means~~, torsion coil springs ~~are disposed on each~~
of said pair of arm shafts to bias said pair of arms so that said ends are biased in a closing
direction; and

both ends of a cam shaft rotatably supporting said pair of arm shafts and said arm drive cam are supported by said supporting structure means.

Claim 12 (currently amended): A conveyor device for containers comprising:
a chuck device as described in ~~any one of claim 1 through claim 11~~; and
a mobile body moving said support structure means of said chuck device along a predetermined conveyor path.

Claim 13 (original): A conveyor device as described in claim 13 wherein a plurality of said chuck devices are disposed on said mobile body along said conveyance path.

Claim 14 (currently amended): A conveyor device as described in claim ~~12~~ 13 or ~~claim 14~~ wherein an operation section is disposed along said conveyance path that comes into contact with said operation member when said chuck device moves.

Claim 15 (original): A conveyor device as described in claim 14 wherein said operation section includes a movable section capable of moving between an active position, where said operation section is in contact with said operation member and operates said operation member, and a stand-by position away from said operation member.

Claim 16 (original): A conveyor device as described in claim 15 wherein said movable section is driven by an electrical servo motor between said active position and said stand-by position.

Claim 17 (currently amended): In a chuck device wherein a chuck claw is removably mounted on an end of an arm driven to perform a grasping action,
a chuck device wherein:
a cylindrically indented bearing surface is disposed on said arm;

a holding piece equipped with a cylindrical outer perimeter surface curved along said bearing surface is disposed on said bearing surface using a tightening mechanism~~means~~; and

an attachment base curved along said bearing surface and capable of being inserted between said support piece and said bearing surface ~~is disposed on said chuck claw.~~

Claim 18 (currently amended): A chuck device as described in claim 17 wherein said tightening mechanism comprises~~means is~~ a bolt.

Claim 19 (original): A chuck device as described in claim 18 wherein a slit is formed on said attachment base of said chuck claw to allow said bolt to pass through.

Claim 20 (currently amended): A chuck device as described in claim 18 ~~or claim 19~~ wherein:

a chuck bearing is disposed on said arm to receive reaction generated on said chuck claw during said grasping action;

said bearing surface is formed to connect with a side of said chuck bearing section that comes into contact with said chuck claw;

said bolt is set up to attach to said bearing surface in such a direction that, going toward a rear end of said arm, said bolt extends from said bearing surface toward a back surface relative to a side of said arm in contact with said chuck claw.

Claim 21 (original): A chuck device as described in claim 20 wherein:
an arm shaft rotatably supporting said arm is disposed behind said bearing surface;
and

said bolt is screwed in between said bearing surface and said arm shaft.

Claim 22 (currently amended): A chuck device as described in claim 20 ~~or claim 21~~ wherein:

left and right arms are disposed;

Claim 22 (currently amended): A chuck device as described in claim 20 ~~or claim 21~~ wherein:

left and right arms are disposed;
a bearing ~~surfaces~~ surfaces is disposed inward from each arm;
said bolts pass through said support pieces from inward of said arms and are screwed into said arms; and
slits are disposed at ends of said chuck claws to allow insertion of a tool used to manipulate said bolts.

Claim 23 (currently amended): A chuck device as described in claim 22 wherein a spring mechanism ~~means~~ is disposed between said support pieces attached to said bearing surfaces of said arms to draw said support pieces toward each other.

Claim 24 (currently amended): A chuck claw wherein:
a grasping section performing grasping actions is formed on a first end; and
an attachment base curved to form a cylindrical surface is formed on a second end.

Claim 25 (original): A chuck claw as described in claim 24 wherein a slit extending in a perimeter direction of a cylindrical surface defined by said attachment base is disposed on said attachment base.

Claim 26 (currently amended): A chuck claw as described in claim 24 ~~or claim 25~~ wherein a slit that divides said grasping section along a direction of an axis of a cylindrical surface defined by said attachment base is formed on said grasping section.

Claim 27 (currently amended): A conveyor device comprising:
a mobile body capable of pivoting around a predetermined center; and
a chuck device as described in ~~any one of claim 17 through claim 23~~;

wherein a plurality of said chuck devices are disposed along an outer perimeter of said mobile body.